

THURSDAY, DECEMBER 2, 1875

THE GOVERNMENT AND THE POLLUTION OF RIVERS

Pollution of Rivers. What Means can be adopted to prevent the Pollution of Rivers? A Paper read at the Social Science Congress, Plymouth and Devonport, September 1872, by William Hope, V.C. (London, 1873.)

Food Manufacture versus River Pollution. A Letter addressed to the Newspaper Press of England, by the same Author. (London: Stanford, 1875.)

THE question of River Pollution, one of undoubted importance to the country at large, has been once again raised by Mr. Hope, so well known for his untiring zeal in the cause of sewage farming, in the two above-named pamphlets. As involving questions of science—or at least of applied science—we feel called upon to offer some remarks upon the subject, the more so as it is one having such unquestionable sanitary bearings as to have been made the subject of Select Committees, Royal Commissions, and of at least three Parliamentary Bills.

We shall in the first place give a brief abstract of Mr. Hope's pamphlets, in order to lay before our readers the present state of the sewage question, before proceeding to consider the manner in which the subject has been handled by the Legislature.

In the first-named pamphlet the author passes in review the chief processes which have been proposed for preventing the pollution of rivers by sewage, classifying all systems under two divisions—"those which profess to deal with part only of the sewage, and those which profess to deal with the whole." The inefficacy of the former is summed up in the following words (page 5) :—

"But supposing that they really accomplished all they are intended to effect, the sewage question would still be as far from solution as ever, for the part of the total refuse which they profess to deal with is only about a half per cent. of the whole."

Of processes professing to deal with the whole of the sewage the first noticed are those precipitation schemes in which the sewage matter is supposed to be precipitated by the addition of some chemical substance. The so-called "A B C" process is considered at some length, and its not very creditable history traced; analyses of the various precipitating mixtures employed by this company are given, beginning with that first employed which the author distinguishes as "Moses" (because stated by the patentee to have been first revealed to Moses in the wilderness and communicated by him to the children of Israel!), and concluding with that in use at Leeds at the time of reading the paper.

When we state that this mixture consists of alum, blood, clay, and charcoal refuse from Prussian blue works, our readers will at once perceive the justice of the sentence pronounced by Mr. Hope—that none of the ammonia in solution is precipitated, but runs away in the effluent water. We may furthermore recall to mind the fact that the process as carried on at Leicester and Leamington, with a mixture containing the same ingredients in different proportions, was made the subject of an exhaustive inquiry by the Rivers Pollution Commis-

sion, and justly condemned by that body in their second Report, on the grounds of its failing to remove the organic polluting substances in the state of solution. The same objections are applicable to Forbes' phosphate of alumina process, and to Anderson's process, which are the next considered. Mr. Whitthred's phosphate of calcium process is spoken of somewhat more hopefully, although at the time of reading the paper it was in a very early stage of development, while Weare's peat charcoal process is unhesitatingly condemned—"the effluent water resulting from it is, as a matter of fact, still sewage."

General Scott's hydraulic cement process, which consists in precipitating lime and clay in the sewage, is effective in clarifying and to a great extent deodorising the sewage by the removal of suspended matters in the form of "sludge," but from a sanitary point of view the sewage question is untouched, as the inventor does not profess to deal with the effluent water.

The purification of sewage by its direct application to land as effected by irrigation next receives consideration, the author pointing out that this is really an effective means of disposing of sewage—a statement fully borne out by every scientific authority who has examined into the method. Without at present entering too fully into details, we may state that the author's experience has led him to the conclusion that the successful treatment of sewage as a manure depends upon its thorough intermittent downward filtration through the soil, with due precautions against overflowing the land. By those who have followed the question from the beginning, it will be remembered that the chemical principles of "downward intermittent filtration" were first discovered in the laboratory of the Rivers Pollution Commission, and its efficiency made known in their first Report. The chemistry of the process, it is scarcely necessary to add, is accelerated oxidation, and Mr. Hope had been independently led to adopt this principle as applied to irrigation on an experimental sewage farm at Romford. The remainder of the pamphlet is chiefly devoted to what we cannot but consider as a fruitless discussion upon the precise meaning of the terms "irrigation" and "intermittent downward filtration," it being contended that the two processes are really identical—an opinion in which we feel constrained to differ from the author, since, although the involved principles are most probably the same, the methods of application are essentially different. The results of the early experiments upon the Romford farm were made known to the British Association Committee at the Brighton meeting, and are thus summarised by the author :—

"Although the soil is exceedingly siliceous, and ill-adapted for the retention of manure, yet out of every 100 parts of nitrogen applied in the sewage, no less than 40 were actually converted into crops, 50 parts were unaccounted for (remaining chiefly in the soil), and only 10 parts escaped in the effluent water, of which again only a fraction was still in an organic form."

The second pamphlet is a spirited appeal to the press to take up the sewage question, but as it relates chiefly to the financial aspect of the matter, it is not well adapted for abstracting in these columns. It may be stated, however, that the author therein admits that he has met with heavy losses in the working of the Romford farm, because, in his own words, "he has not had the sewage of Romford to convert." The original outlay, it seems, had been based

upon the assumption of his receiving the sewage from a population of 8,000, instead of which the amount actually received was that due to a population of about 3,000.

Mr. Hope has thus done excellent service in continually directing attention to and practically demonstrating, often at great pecuniary sacrifice, the applicability of the irrigation scheme to the disposal of sewage. It is true that the Towns Sewage Commission of 1865, in their third Report, did not speak favourably of the process, stating that their analyses proved that the effluent water from the Rugby works contained about the same quantity of dissolved organic impurity as the raw sewage, but it is now known that the process of analysis employed by them gave fallacious results, and analyses by the Rivers Commission (First Report) show that the process removes an average of 81·7 per cent. of the nitrogen, and 68·6 per cent. of the carbon contained as *dissolved* organic impurity, and 97·7 per cent. of the *suspended* organic pollution.

So much for irrigation. The other plan recommended by the Commission, Frankland's "downward intermittent filtration," is equally if not more effective. An average of 87·6 per cent. of nitrogen and 72·8 per cent. of carbon contained as *dissolved* organic pollution is removed by the operation, and *all* suspended impurities. We may further state that the plan has been applied by Mr. Bailey Denton to the sewage of Merthyr Tydvil, and has been in successful operation at that town for a period of three years.

Two effective schemes for the treatment of sewage—either of which might be employed according to the locality—are thus offered, so that, the sewage question being practically settled, let us now consider the action of the Government in the matter.

It is at least fifteen years since the efficacy of irrigation was first made known, and seven years since the discovery of intermittent filtration. In a letter on the sewage question published in 1865 by Mr. Hope, it is stated that "there have already been six Select Committees and two Royal Commissions on the question, independently of the Main Drainage Committee of the Metropolitan Board of Works, which has investigated the subject for five long years, and these Committees and Commissions have published no less than ten reports." A Rivers Pollution Commission was formed in 1865 and replaced by another in 1868, which continued its work down to 1874. These Commissions have cost the country from 40,000*l.* to 50,000*l.*, and in their laboratory the various processes devised for the purification of sewage and other foul liquids have been quantitatively examined and the results made known in no less than nine consecutive reports. Remedies for the different forms of pollution have been clearly and consistently pointed out, and various recommendations suggested for legislation. The standards of polluting liquids proposed by the Commission to be fixed by Act of Parliament have been substantially approved of both by English and Continental chemists of eminence. Now the members of a Royal Commission are presumably appointed because specially qualified for the inquiry, a presumption which has been amply testified in the case of the Rivers Commission. Notwithstanding this—notwithstanding that a code of standards has been proposed for legislative enactment—in spite of the fact that practical and efficient remedies do already exist for the disposal of sewage,

down to the present time nothing whatever has been done by the Government. The Duke of Northumberland's Bill of 1873 embodied, it is true, all the recommendations of the Rivers Commission, but, most wonderful to relate, in the Rivers Pollution Bill brought in last session, the whole of the work done by that Commission is totally ignored; and the Bill moreover shows that its framers were totally unacquainted with the advancement of science in this direction during the last twenty years.

Confronting these facts with a statement in Mr. Hope's second pamphlet, that "the Registrar-General's returns, confessedly incomplete from various causes, show that 'sanitary authorities' have been killing by means of enteric fever no less than 14,000 persons per annum," we now leave the subject to the serious consideration of the Legislature.

THE MANCHESTER SCIENCE LECTURES *Science Lectures for the People, delivered in Manchester.*

First, Second, Third, Fourth, Fifth, and Sixth Series.
1866-74. 3 vols. (Manchester: Heywood.)

IT is now nine years since Prof. Roscoe made the bold experiment of ascertaining whether the working men of Manchester would appreciate the value of scientific instruction given in a plain but correct manner, and illustrated by suitable experiments and diagrams. The magnificent success that attended the early efforts of Prof. Roscoe has led the experiment to be repeated yearly until it is now, we hope, a settled institution. In the preface to one of the series we learn that each lecture, on an average, has been attended by nearly 1,000 persons, and an additional and wider audience has been secured by the verbatim reports of the lectures which are bound together in the volumes before us. Published at a penny each, from 5,000 to 10,000 of each of these lectures have been sold, and the demand for back numbers still continues.

Certainly it is to be hoped, as Prof. Roscoe remarks, "that the example of Manchester may be followed by other large towns, for surely nothing can at the present time be more important than to infuse into the minds of the people an idea of that scientific truth which is rapidly being recognised as not only lying at the foundation of our material welfare, but also of our social and moral well-being." We are aware that many of our large towns are doing good work in this direction by the lectures regularly arranged in connection with some local institution; witness, for example, the immense audiences attracted by the admirable lectures yearly given in connection with the Midland Institute at Birmingham. But the lectures at these and similar institutions are chiefly frequented by the middle classes, whereas we are assured that at the Manchester lectures the class of persons present was chiefly working men, for whom the lectures were designed, and who by their marked attention and interest invariably showed how keenly they appreciated the information that was given. It is said that to make working-men lectures a success, a very low entrance fee must be charged, and this involves a pecuniary loss that must be met by local subscriptions. This must necessarily be true of the first course or two, when the people will not pay for that of which they have had no experience. But